

## ABSTRACT

The invention provides systems, including apparatus, methods, and kits, for the  
5 microfluidic manipulation and/or detection of particles, such as cells and/or beads. The  
invention provides systems, including apparatus, methods, and kits, for the microfluidic  
manipulation and/or analysis of particles, such as cells, viruses, organelles, beads, and/or  
vesicles. The invention also provides microfluidic mechanisms for carrying out these  
manipulations and analyses. These mechanisms may enable controlled input,  
10 movement/positioning, retention/localization, treatment, measurement, release, and/or output  
of particles. Furthermore, these mechanisms may be combined in any suitable order and/or  
employed for any suitable number of times within a system. Accordingly, these combinations  
may allow particles to be sorted, cultured, mixed, treated, and/or assayed, among others, as  
single particles, mixed groups of particles, arrays of particles, heterogeneous particle sets,  
15 and/or homogeneous particle sets, among others, in series and/or in parallel. In addition, these  
combinations may enable microfluidic systems to be reused. Furthermore, these combinations  
may allow the response of particles to treatment to be measured on a shorter time scale than  
was previously possible. Therefore, systems of the invention may allow a broad range of cell  
and particle assays, such as drug screens, cell characterizations, research studies, and/or  
20 clinical analyses, among others, to be scaled down to microfluidic size. Such scaled-down  
assays may use less sample and reagent, may be less labor intensive, and/or may be more  
informative than comparable macrofluidic assays.